Public Health Training Commission.

C. H. 414.

Organisation and Administration

OF THE

HEALTH INSTITUTE OF POLAND

AND OF ITS

SCHOOL OF HYGIENE

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THE STATE INSTITUTE OF HYGIENE AND SCHOOL OF HYGIENE, WARSAW.

PART I.

1. THE HEALTH INSTITUTE OF POLAND.

One of the Polish Health Administration's first acts was to found, at the end of 1918, a Central Epidemiological Institute, which met a most urgent need. The first steps towards its foundation were taken in somewhat difficult circumstances as soon as the troops of occupation had left Polish territory.

In the course of the first meetings of the Constituent Assembly, the Government obtained the necessary credits for carrying on the campaign against epidemics. A fraction of these credits, or about 100,000 dollars, was set aside for the creation of the Epidemiological Institute.

There were already in existence at Warsaw an Anti-Rabies Institute, a Vaccine Institute and a Serological Institute. The Bacteriological Institute of the University also had a small laboratory which made bacteriological analyses for the health authorities. All these institutes were amalgamated into a single body constituting a central organisation under the authority of which were placed the branches that were soon set up in the provincial towns. Apart from this central Institute and its dependencies, mention should also be made of the mobile laboratories which worked during the first two years at a time when serious epidemics were in progress.

The chief task of the Institute was to help the health authorities and to solve the extremely urgent problems which arose in public health with the assistance of its laboratories. As long as epidemics constituted the most acute health problem in Poland, the study of infectious diseases and the

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production of vaccines and sera naturally constituted the principal task of the Institute. From 1919 to 1922, about 170,000 bacteriological analyses were made, and during the same period 3,000 litres of anti-cholera vaccine, 3,900 litres of anti-dysentery vaccine and 12,000 litres of " Tetra " vaccine were prepared.

When the epidemics were brought under control and health problems of a less urgent character arose, the Institute was able to enlarge its field of action. A department for the examination and testing of pharmaceutical products and foodstuffs was soon attached to it. Later, departments of statistics and epidemiology were created. All these departments now constitute the State Health Institute.

The Institute's work covers three different branches:

1. Scientific and experimental research with a view to the practical application of its results. One may mention the work undertaken on malaria, scarlet fever, typhus, etc.

2. The Central Institute and its branches carry out the laboratory analyses required by the health services of the State and of the communes.

3. The preparation of sera and vaccines. This, however, does not constitute a State monopoly in Poland. Sera prepared in private sero-therapeutic laboratories, both Polish and foreign, are also used in the country. The fact that the State itself produces sera and vaccines nevertheless exerts a favourable influence on the quality and price of products from unofficial sources placed on the market.

In 1920 the creation of a new department for the examination and testing of vaccines was decided upon. This department has undertaken numerous scientific researches, all of which aim at some practical result and have on several occasions led to co-operation with the Health Organisation of the League of Nations.

* * *

The Institute at present consists of four independent departments:

The *first department* (bacteriology and research) consists of the bacteriological and experimental medicine sections. This department includes, in addition to the sections for bacteriological examinations and the testing of sera, laboratories for medical zoology, the Wassermann test, the testing of chemico-therapeutic preparations and individual research.

The *second department* (sera, vaccines and vaccination) includes a section for the preparation of sera and vaccines and sections for producing the vaccinal lymph, the anti-rabies vaccine, etc. To this department is attached the Sluzew Farm, where there are stables for horses in a dismantled Russian fort.

The *third department* (chemistry, pharmaceutical chemistry and pharmacology) consists of the former Pharmaceutical Institute.

The *fourth department* (training) consists of a School of Hygiene the organisation of which is described in Chapter II.

We give below a list of the present staff of the Institute:

Director-General of the Institute: Dr. L. Rajchman (at present Medical Director of the Health Section of the Secretariat of the League of Nations).

1. Department of Bacteriology and Experimental Medicine:

Director and Chief of the Serological Research Section:

Dr. L. Hirszfeld.

(*a*) *Section for Bacteriological Diagnosis*:

Director: Dr. S. Sierakowski (three assistants and auxiliary staff).

(*b*) *Section for Medical Zoology:*

Chief: Dr. L. ANIGSTEIN, Correspondent member of the Malaria Commission of the League of Nations.

(*c*) *Section for Serological Research* (three assistants and auxiliary staff and several doctors appointed to study certain special scientific problems).

2. DEPARTMENT FOR THE PRODUCTION OF SERA AND VACCINES:

Director and Chief of the Serum and Vaccine Section: Dr. J. CELAREK.

(*a*) *Section for the Preparation of Sera and Vaccines* (five doctors and auxiliary staff).

(*b*) *Section for Anti-Rabies Vaccination:*

Chief: Dr. Z. KARLOWSKI (one assistant and auxiliary staff).

(*c*) *Section for the Preparation of the Vaccinal Lymph:*

Chief: Dr. S. ZDANOWICZ (one assistant and auxiliary staff).

3. DEPARTMENT OF CHEMISTRY AND FOR THE TESTING OF PHARMACEUTICAL PRODUCTS.

Director: Dr. S. WEIL (ten assistants and auxiliary staff).

4. TRAINING DEPARTMENT: SCHOOL OF HYGIENE (see Chapter 2).

The staff of the branches distributed throughout the country is as follows:

1. *Lwow.* Chief: Dr. N. GASIOROWSKI (three assistants and auxiliary staff). Two sections: bacteriology and rabies.

2. *Cracow.* Chief: Dr. F. Eisenberg (one assistant and auxiliary staff).

3. *Lodz.* Chief: Dr. T. Zaleski (one assistant and auxiliary staff).

4. *Lublin.* Chief: Dr. Chrominski (one assistant and auxiliary staff).

5. *Torun.* Chief: Dr. S. Kaczynski (one assistant and auxiliary staff).

6. *Vilna.* In charge of the laboratories: Z. Modrzewska (and auxiliary staff).

THE SCHOOL OF HYGIENE, WARSAW.

2. SCHOOL OF HYGIENE.

Although the State Health Institute on several occasions organised post-graduate courses for doctors of the Polish Health Administration, there was no institution in existence capable of giving systematic training in hygiene to young doctors wishing to enter either the State service or that of the municipalities.

The Polish health authorities fully realised the advantages that would be derived from the creation of an educational centre in which a fully specialised body of health experts could be trained. Accordingly, in order to remedy this deficiency, the Polish Government decided to found a School of Hygiene. The International Health Board of the Rockefeller Foundation having generously offered to share in the expenses caused by the creation of this school, an agreement was reached in 1922 between this Foundation and the Health Ministry under which the Rockefeller Foundation contributed a sum of 212,500 dollars (which was subsequently raised to 300,000 dollars) for the construction and equipment of the School of Hygiene, on condition that the Government should furnish the necessary land free of charge and should provide for the upkeep of the school. During the building operations, the State was obliged to spend a further sum of 150,000 dollars in view of the increase in the price of material, and there are still expenses to be met.

The position of Director of the School (which constitutes, as stated above, the fourth Department of the Health Institute) was entrusted to Dr. Chodzko, former Minister of Health, member of the Health Committee of the League of Nations.

The school, which is still only in its initial stage of development, at present consists of five sections:

1. *Statistical and Epidemiological Section:*

   Chief: Dr. M. Kacprzak (one assistant and auxiliary staff).

2. *Social Hygiene Section:*

Chief: Dr. J. Lubczynski.

3. *Physiology and Labour Hygiene Section:*

Chief: Dr. B. Nowakowski.

4. *Bio-Chemistry and Alimentary Hygiene Section:*

Chief: Dr. K. Funk (two assistants and auxiliary staff).

5. *Sanitary Engineering Section:*

Chief: A. Szniolis.

A public health museum organised on entirely new lines will shortly be attached to the School of Hygiene. Apart from its purely didactic aims, this museum will allow the municipal and communal authorities to obtain the latest information on public health and sanitary engineering. When these authorities wish, for instance, to construct a hospital, to build a drain or to establish a water-filtration plant, they will be able by means of the models collected in this museum to ascertain how these problems have been solved in other countries.

The School will shortly possess a large library.

Although the building of the School of Hygiene has not yet been completed, its teaching staff has already given several advanced courses for medical public health officials, disinfection experts, medical practitioners, etc. In 1924 three advanced courses, attended by 76 students, were organised. In 1925 there were 11 courses, attended by 228 students. In addition, 32 lectures were delivered on various subjects connected with public health.

These courses may be divided into the following three main groups:

1. Courses organised by the School of Hygiene on the proposal of the General Directorate and intended for public health officials. In 1924 there were three courses (76 students) and in 1925 five courses (86 students).

2. Courses organised by other official authorities in co-operation with the School of Hygiene and intended for non-medical staff such as labour inspectors, etc. In 1925 four courses were organised, which were attended by 95 students.

3. Courses of hygiene organised by the School of Hygiene in conjunction with different scientific societies and social institutions. These courses aim at inculcating the principles of hygiene among the people. In 1925 two of these courses were organised and were attended by 80 persons.

In view of the housing shortage, it proved necessary to attach to the School of Hygiene a hostel for students attending the courses given at the School.

Through the Rockefeller Foundation, the American "Joint Distribution Committee" offered the Polish Government its financial assistance to permit of the acquisition of the "Amelin" group of buildings, which thus forms a third unit by the side of the Institute and of the School of Hygiene, and is attached to the latter.

The "Amelin" Institute, in addition to the Students' Hostel, contains an annex of the Sanitary Engineering Department of the School, in which different practical work belonging to this branch of hygiene can be carried out.

In pursuance of an agreement with the Municipality, the Office of the District Medical Adviser of Mokotow has been established in the "Amelin" Institute, as well as numerous dispensaries for tracing and treatment of cases of disease, including anti-tuberculosis, anti-venereal, anti-malaria and anti-trachoma dispensaries; a preventorium; crèches, and a child-welfare section. The students of the School who attend the consultations may thus see the immediate practical application of the theoretical instruction given them at the School.

PART II.

1. REPORT ON THE SCIENTIFIC ACTIVITIES OF THE STATE HEALTH INSTITUTE

[*Translation.*]

The scientific institutes of the former Ministry of Public Health were established at a time when it was particularly difficult to carry on purely scientific research. The organisation of the State itself was only in its infancy, and the mobilisation of the scientific and medical resources of the country made it difficult to create new institutes and to develop the spirit of pure research, which is the foundation of all scientific work. The epidemics which were rife in the country required scientific study; moreover, the international aspect of certain laboratory questions had also to be taken into account.

First of all, an account will be given of the work carried out by the State Health Institute, which is of particular importance in view of its diagnostic value; a survey will then be given of research-work in theoretical microbiology, experimental medicine and kindred branches of study.

Clinical Diagnostic: Typhus.

In 1920, there was a serious epidemic of typhus in Poland. An account is given later of the experimental work carried out in connection with this disease, and mention will only be made here of a memorandum on hæmatology by L. Anigstein. This author shows that nuclei of rod-shaped leucocytes exist in the blood of persons infected with typhus.

Their proportion reaches 30 per cent to 45 per cent at the end of the first week, but afterwards falls to 10 per cent.

Influenza.

The bacteriological research-work carried out by Z. Milinska showed that the Pfeiffer bacillus is of comparatively rare occurrence in cases of influenza. On the other hand, the *diplostreptococcus epidemicus* is frequently found. The same phenomenon was observed by Rosenau in America and Wiesner at Vienna.

Epidemic Icterus.

In 1922, there was a very widespread epidemic of jaundice centred at Rowno, one of the towns through which refugees passed coming from South Russia. L. Anigstein and Z. Milinska describe a rare form of infectious jaundice in the course of which the blood of the patient harbours atypical paratyphus bacilli. The authors showed that in the majority of cases the serum of patients infected with this disease could agglutinate certain strains of Aertryk bacilli known as the "Stanley type". Certain serums from individuals infected with catarrhal jaundice acted in the same way. The ætiology of the sporadic and epidemic forms of jaundice may therefore be the same.

Weil's Disease.

L. Anigstein, studying other forms of jaundice, noted for the first time in Poland the presence of *Leptospira icterohæmorrhagica* in wild rats. He could not, however, find any evidence of this micro-organism in human beings.

Cerebro-spina Meningitis.

The groups of meningococci were identified by F. Przesmycki, who discovered type A in 85 per cent of the cases and type B more rarely.

Plaut-Vincent Angina.

M. Brokman and H. Sparrow made a bacteriological and epidemiological study of an epidemic of this disease which broke out in a children's home.

Mention should also be made of the attempts of Anigstein to introduce serological methods for identifying certain protozoans.

Serological Diagnostic of Syphilis.

Very special attention was devoted to this question. The Institute took an active part in the work undertaken by the Health Committee of the League of Nations for unifying and standardising serological methods. The following processes were tested: Sachs-Georgi, Meinicke, Sigma reaction; the Meinicke-Dold flocculation reactions; the Kahn modification and similar reactions. In all, 50,000 serums have been examined by Mme. Milinska, and the value of the technical methods employed at the Institute has been confirmed by the Copenhagen Conference. In our laboratories each serum is tested by two assistants, one of whom carries out the reactions of fixation of the complement and the other the flocculation tests. The Bordet-Wassermann reaction is carried out in accordance with the McIntosh method, but by means of two antigens (one of which is the Bordet-Ruhlens); the Sachs-Georgi reaction and the Sigma reaction in a slightly modified form are employed, using antigens of origin.

Study of the Paratyphoid Group.

Of the varieties of paratyphus bacilli, which caused widespread epidemics during the war, the para β described in Albania by Weil and Saxl, and para C, described in Macedonia by Hirszfeld, were identified. Para C was also shown to exist in Poland. It was therefore necessary to determine the relations between the different varieties of paratyphus bacilli. Hirszfeld and Mlle. Seydel compared 35 strains which had been isolated either in England (where they had been regarded as Aertryk bacilli) or

Germany or Poland. These authors showed that para β is identical with para C and that the latter is quite distinct from para B and the Aertryk varieties, although certain varieties constitute intermediary forms. No process of transition from one type to another was observed. The agglutination of para B and para C takes the form of large flakes in the first case and very fine flakes in the second, as had already been shown by Weil-Felix. It is difficult, however, to utilise this discovery for differential diagnostic purposes, since the agglutination depends upon a number of outside factors.

Analysis of Receptors.

Hirszfeld and Seydel could not definitely prove the existence of different H and O receptors in the different strains of typhoid bacillus which they examined. The difference observed in the mode of agglutination is probably due to a difference in the affinity for water. When agglutination takes the form of large flakes, the separation of the aqueous phase is a difficult process. The O strains are therefore in the nature of hydrophobic colloids and the H strains of hydrophilous colloids. If the bacterial suspension is boiled, the albumen coagulates and separation takes place more readily in the aqueous phase. Accordingly, a number of physical differences between X 19 H and O have been discovered.

Mention has already been made of the work of Anigstein and Milinska in connection with the different varieties of paratyphus bacilli found in infectious forms of jaundice and probably in certain forms of sporadic jaundice also.

Physical Microbiological Analysis.

In the field of general microbiology, Sierakowski, Modrzewska, Rabinowicz and Salomon endeavoured to trace the influence on a number of species of bacteria of diet and of factors governing growth, such as the thickness of the nutritive medium, the Ph, the degree of concentration of salts, etc. The authors observed wide differences among

the bacteria examined; factors which are apparently unimportant, such as the degree of concentration of the salts and the thickness of the layer of agar, may have a selective effect.

It was shown by qualitative experiments that the number of living bacilli rapidly diminished after a few days as the nutritive medium became alkaline. Acidity, on the other hand, increases during growth, owing to the generation of carbonic acid gas, which affects the Ph of the medium. In air-tight receptacles from which the carbonic acid cannot escape, all cultures attain Ph 6.8. At this stage the carbonic acid is semi-ionised. The ærobic cultures are at first acid and then become alkaline, and the final Ph varies according to the species of bacteria, but remains characteristic of a given species (Sierakowski, Milejkowska).

Raabe carried out similar research-work on protozoan saprophytes (*Provazekia edax*) and arrived at the same results.

Chemical Analysis.

Supniewski, in a series of publications, studied the nutritive exchanges of the pyocyanic bacillus and showed that the majority of fats may serve as sources of carbo-hydrates and may be oxidised up to the degree CO_2. He established the existence of certain intermediary substances previously unknown. Compounds containing hydroxyl and carboxyl groups are oxidised to the carbonic acid stage, and the acid so formed lowers the Ph to 6.6. Contrary to the process in the case of acids, it is the COOH group which is then oxidised, and the alkalinity is thereby raised to 8.8 and prevents any further growth. The pyocyanic bacillus assimilates the azote from the ammonia and tends to transform the other azotised compounds to NH_3. The majority of cyclic combinations cannot be utilised by the pyocyanic bacillus, but those which contain an aliphatic chain are assimilated. Stereochemical structure plays an important part, since the bacilli can decompose ortho-aminobenzoic acid, but cannot attack meta and para combinations.

Agglutination by Alkalis.

Sierakowski and Milejkowska determined within what limits of Ph mediums become unfit for the culture of bacteria, and described an agglutination in the alkaline zone which differs from the usual agglutination and is more akin to conglutination.

Formation of Toxins and Ph.

Hirszfeld, Przesmycki and Sierakowski endeavoured to ascertain the influence of various physical factors on the toxicity of Shiga bacilli cultures. They showed that the toxins are formed at the time when the alkalinity of the nutritive medium increases, that is to say, when the bacteria are being destroyed. The rate of increase of alkalinity corresponds, according to Sierakowski, with the depth of the broth. When the broth is 1 cm. deep, for instance, the medium becomes alkaline more rapidly than when the depth is greater, and the toxin also forms more rapidly. It is therefore a mistake to endeavour to ascertain the exact moment when the toxin forms, as this phenomenon depends upon the rapidity of alkalinisation and the depth of the nutritive medium.

Morphology: Vibriotrix zeulonica.

Anigstein showed that the *Vibriotrix zeulonica Castellani* possesses cilia, a fact which facilitates its identification.

Encephalitozoon Cuniculi.

Anigstein carried out research-work on encephalitis in laboratory animals, a disease which from the histopathological point of view presents a certain analogy with epidemic encephalitis. He observed inflammatory foci in 65 per cent of the mice examined and encephalitozoon spores in 30 per cent.

Spores were found not only in the kidneys but also in the cerebral vessels, from which they penetrate to the cerebral cells. These spores represent a very advanced stage of development; in fact, an amœba emerges from each spore and gives

rise to a polynuclear plasmode, which decomposes and forms a pansporoblast. In each pansporoblast there are sporoblasts with two nuclei, each of which forms two spores. A fixed virus for mice was obtained by passage.

Bacteriological Micromethodics.

Sierakowski, completing the work begun by Orskov, worked out a system of bacteriological micromethodics. Very thin layers of agar are spread on plates and the young cultures can be examined at the end of a few hours.

The method is applicable to the bacilli of diphtheria, tuberculosis and typhus.

Mutation of Bacteria.

Hirszfeld and Seydel showed that the X 194 can grow, as Type O does at high temperatures; at a normal temperature the creatures resume their usual form, but some of them permanently preserve the new characteristics they have acquired. Similarly, the agglutinative characteristics of varieties of typhus and paratyphus bacilli change when they are cultivated at high temperatures. The agglutinative capacity grows to such an extent that strains which had remained for a long time in laboratories and had lost this capacity fully recovered it — a phenomenon which may prove to be of very great practical importance.

Research in regard to Bacteriophage.

B. Fejgin obtained mutations in the course of his research work on bacteriophage. Fejgin and Supniewsky consider bacteriophage to be inanimate bodies. The lack of catalase and reductase and the absence of any modification of the Ph would seem to negative the view that the bacteriophage is a living organism. Fejgin showed that the strains of Shiga bacilli which resist bacteriophage have undergone very considerable modifications from the bacteriological and serological point of view. Similarly, the atypical forms of

Shiga bacilli found in stools are probably strains which have undergone mutations.

Fejgin isolated bacteria which, from the biochemical point of view, act like coli-bacilli, whereas, from the serological point of view, they are akin to the Shiga bacilli, which resists the action of bacteriophage. The author further succeeded in obtaining a bacteriophage for X 19. The variety X 19 which resists bacteriophage possesses the remarkable biological property of forming a yellow or green pigment.

Research in Typhus.

Special mention should be made of the work of Sierakowski, who isolated two varieties or proteus O which gave specific reactions with typhus serum. Sierakowski's discovery proves that serological reactions do not in themselves affect the etiological rôle played by specific micro-organisms.

Fejgin's work seems to show that the proteus plays an ætiological part, as he isolated from special culture mediums seven strains of proteus from thirty guinea-pigs infected with typhus. Some of the strains isolated were typical proteus X 19, while others were identical with the bacteriophage-resisting types of proteus already described.

Fejgin concluded that the bacteriophage may play an important part in experimental typhus infection. He obtained a febrile reaction, similar to that occurring in experimental infection, by injecting bacteriophage X 19 into guinea-pigs. He also obtained immunity, which he thinks specific, against subsequent infection with typhus.

Fejgin admits that the virulence of X 19 H depends upon the state of dispersion and that it represents a definite form of the agent of typhus. He succeeded in isolating the proteus X 19 H in lice into which the agent of typhus (Ricketsia) had been injected.

According to Fejgin's investigations, bacteria capable of passing through a filter play an important part in infection. He succeeded in infecting guinea-pigs with bacteriophage X 19 and in isolating from their organs strains of X 19.

Fejgin infected lice with bacteriophage X 19, using the Weigl method. Ten days afterwards he ground them and suspended them in physiological serum. From the lice so infected varieties of X 19 were isolated.

The injection of the bacteriophage of virulent Eberth bacillus into the peritoneum of the guinea-pig causes a rise in temperature after ten to fourteen days of incubation. Similar nosological results can be produced by injections into the organs of infected animals. It is possible to isolate from these organs strains some of which are agglutinated by the anti-typhus serum and others by the anti-A or anti-B serum.

A bacteriophage against diphtheric bacilli was also obtained.

H. Sparrow in his research-work dealt with the question of immunity in typhus. He proved by auto-inoculation that experimental typhus in guinea-pigs is identical with natural infection in human beings. After injection of cerebral matter from an infected guinea-pig, he noted the development of typical infection in himself. He worked out an exact method of immunisation of animals by means of small doses of virus mixed with serum from a convalescent patient.

Titration of Anti-dysenteric Serum.

The Health Institute took an active part in the work of the Health Committee on the standardisation of anti-dysenteric serum. According to Olitzky and Kligler, there is a difference between the toxins affecting the nervous system and those acting on the intestinal canal, the first being exotoxins and the second endotoxins, but this is not confirmed by Hirszfeld, Przesmycki and Sierakowski. Horses immunised by Dr. Saski with living bacteria or filtrates of young cultures give immunising serum which from the qualitative point of view is the same. A number of other problems were also studied, such as the relations between capacity for combination and toxicity, the best kind of animal to use and the importance of differences between individual animals.

Experiments with Anti-diphtheritic Serum.

Brokman and Sparrow showed that the serum prepared from the same bacterial strain is best utilised by the animal body. The antitoxin is also more completely utilised if the serum is of a low titer. Guinea-pigs vary a great deal in susceptibility. They show a definite relationship between natural susceptibility and the formation of the immunising bodies; the least susceptible specimens are the most difficult to immunise. The skin of some animals apparently possesses greater affinity for passive antitoxins.

Statistical and Experimental Work on Salvarsan.

Before studying work which is on the border-line between serology and experimental medicine, mention should be made of the statistics of intoxications caused by salvarsan which have been prepared by Supniewski. In the period 1919-23, twenty-nine deaths were registered, most of which followed upon the use of foreign salvarsan. These statistics were registered by the Health Committee. Supniewski also prepared an anatomo-pathological table of intoxications of animals by salvarsan.

E. Helman studied the anti-coagulating power of arseno-benzols, a phenomenon which was first observed at our Institute. The first products are entirely ineffective, nitrous combinations alone being active. Neo-salvarsan destroys the citozyme or serozyme or renders the formation of thrombin impossible, although it does not influence its action.

Work on Complement.

Hirszfeld and Klinger showed that the action of complement is connected with the lability of serum globulin. According to this theory, it is possible that a non-specific modification of the degree of dispersion may cause hemolysis. Supniewski showed that hemolysis takes place close to the iso-electrical point when the globulins begin to flocculate.

Research on Immunity in Anthrax.

Supniewski repeated the well-known experiments of Besredka. On the basis of the work of Balteano and others, Supniewski showed that, when an intradermic inoculation is given, infection is more easily produced owing to the fact that phagocytosis becomes more difficult. Anthrax bacteridia cultivated in an albuminous medium may, when they have already formed a capsule, produce signs of immunity even without having been brought into contact with the skin.

Forssman Antigen.

It is known that the organs of the guinea-pig contain heterogenetic antigens, but the presence of these antigens in the circulation had never been proved. Hirszfeld and Halber showed that this antigen also exists in the vascular endothelium. The formation of antibodies does not depend upon the presence of a substance foreign to the organism but upon the presence of a substance foreign to the circulation. The presence of the Forssman antigen in the vascular endothelium seems to indicate that the disturbance of equilibrium observed at the time of the intracarotidian injection of a heterogeneous serum is caused by circulatory disturbances.

As the guinea-pig contains the Forssman antigen, it was thought that the agent of typhus might possess a similar structure, and, if so, this would render the formation of antibodies impossible in the guinea-pig during infection. Mlle. Amsel showed by experimental research that this explanation was incorrect.

Normal Agglutination.

The existence of normal antibodies is a problem of the utmost importance for serology and epidemiology, and all its different aspects would repay study. Hirszfeld and Bialosuknia have shown that the sedimentation of red globules has nothing to do with specific auto-agglutination. The blood-plasma preserve their power of sedimentation when their auto-agglutinins have been removed by absorption.

The two phenomena may also be differentiated by other means, such as hypertonia, cold, etc. Brokman and Mme. Hirszfeld carried out research on the same lines. They drew attention to the existence of substances capable of stabilising the suspensions. After having studied the influence of hyperglobulia and the variable action exercised by sodium citrate, they devised an appropriate technique.

Hirszfeld and Bialosuknia, studying low-temperature agglutination, showed that each serum can be so modified as to agglutinate only at low and not at high temperatures. Mlle. Amsel and Hirszfeld take the view that the high " thermic amplitude " of the antibodies in man is physiological in character, that it is probably dependent upon factors inherent in the constitution and that it does not depend upon an increased capacity of the organism to react.

The existence of blood-groups in horses was proved by Hirszfeld and Przesmycki and in sheep by Bialosuknia and Kaczkowski. The researches of the last-named and those of Amsel, Halber and Hirszfeld show that the constitutive part A of the sheep may be compared to that of the human A, a fact which testifies to the importance of the blood-groups for comparative zoology. Przesmycki tried to utilise the fact that blood-groups exist in animals to carry out transfusions for the purpose of augmenting the sero-productive capacity of immunised horses. It is easy in the case of rabbits to replace the blood of one specimen by that of another. In the case of horses the results are less good, because the difference between the blood of individuals of the same species is too great. It should be noted that the decrease in the antibody rate caused by the transfusion of normal blood and the removal of immune blood does not stimulate in any way the antigenic power.

Iso-agglutinins and their Importance for the General Study of the Constitution.

Von Dungern and Hirszfeld had already shown that blood-groups are transmitted by heredity in accordance with the Mendelian laws. According to H. and L. Hirszfeld they are

an important factor in anthropology. These facts, however, required to be amplified and linked up with the other problems relating to constitution. Mlle. Halber and Mylarski, when studying the blood of Polish recruits, showed that not only from the geographical but also from the serological point of view Poland occupies a half-way position between East and West. By applying Bernstein's heredity formula to the statistics which they had themselves collected or obtained, they showed the value of this formula from the purely mathematical point of view. Hirszfeld, however, points out that in a calculation of this kind it is assumed that all individuals of the various groups have the same biological value, a supposition which is not borne out by the facts observed at the Institute.

Further, Hermann and Mlle. Halber observed in the course of certain pathological conditions the presence of iso-antibodies in the cerebro-spinal fluid.

Serology and the Study of the Constitution.

Von Dungern and Hirszfeld had already shown that iso-antibodies were transmitted by heredity. Hirszfeld drew attention to the hereditary transmission of complement and idiosyncracy and advanced the theory that the other normal antibodies are constituent parts of the serum, that they depend upon the constitution and that they may be compared to biochemical entities. Antibodies acting against bacteria and their toxins are regarded as the product of a reaction to the excitement produced by infection. M. and L. Hirszfeld and Brokman show that the absence of normal antitoxins, or the capacity or incapacity for producing them, are in correlation with the hereditary transmission of the blood-group. These experiments would seem to prove that in actual fact susceptibility to certain diseases is determined by the constitution. The fact that certain properties are hereditary in the same way as blood-groupings give Hirszfeld the idea that the theory of Morgan might find its application here.

The work of the Health Institute is at present directed towards the study of the constitution, and is based on the

principle that the normal antibodies are constitutional elements of the structure of the serum, the formation and development of which are subject to the same fundamental laws as those of morphological elements. Von Otto's theory of the hereditary transmission of acquired immunological properties was not confirmed by the work of Hirszfeld and Mlle. Seydel. New-born animals do not possess normal antibodies; these only appear during growth. The authors are establishing a theory of "serogenesis", by analogy with morphogenesis. Normal antibodies appear at a specific age, which is not the same for all human beings.

Brokman showed that it is possible, by means of an intracutaneous injection of Shiga toxin, to obtain in human subjects a local inflammatory reaction similar to the Schick reaction. 80 per cent of human subjects react positively to a specific dose and 20 per cent negatively. Brokman and Przesmycki found that individuals presenting a negative reaction possess a normal antitoxin independent of any previous attack of dysentery.

The fact that new-born infants do not possess normal antibodies shows that the maternal and fœtal circulations are quite distinct. Hirszfeld and Zborowski showed that normal antibodies, hæmolysins and iso-antibodies only exist in rare cases and in small quantities in new-born infants. Iso-antibodies pass most readily from one circulation to another when the mother and child belong to Group O (90 per cent of the cases). The transference of antibodies is difficult, however, when mother and child belong to Group A (10 per cent of the cases). Retro-placentary blood usually contains very few of these iso-antibodies which could have reacted with the red globules of the fœtus. Thus there are special devices to protect a fœtus of the foreign group, which is exposed to more serious dangers than one belonging to the same group. Indeed, it has been shown that in certain combinations of groups (A and O) the fœtus belonging to the same group as the mother weighs more than that belonging to the foreign group. A study of the literature on this subject shows that when these combinations occur, the mother transmits her group to the child more readily than the father. The authors endeavour to explain

this phenomenon by the fact that some of the fœtuses belonging to the different groups do not fully develop in such circumstances. They also point out that O fathers and AB mothers produce AB children in 23 per cent of cases. There are no definitely established cases of mothers belonging to group O with AB fathers giving birth to AB children. It will thus be seen that certain combinations of parents may be unfavourable to the production of offspring.

Wassermann Reaction and Blood-Groups.

The correlation of blood-groups with the positive Schick reaction and their importance for the offspring show that the biological value of individuals varies according to the blood-group to which they belong. A certain direct correlation was established between immunity phenomena and blood-groups. Thus Mlles. Amsel and Halber showed, on the basis of the material available at the Institute, that the Wassermann reaction disappears more rapidly in the course of treatment in the case of individuals belonging to Group O than in that of individuals belonging to Group AB. Straszynski confirmed these observations at the dermatological clinic.

Work in connection with Scarlet fever.

Dick's discovery regarding the part played by streptococci in scarlet fever was studied in its various aspects. Brokman, Mlle. Fejgin, Mme. Hirszfeld, Mayzner and Przesmycki carried out at the Serological Institute experiments on 800 children and confirmed the principle of Dick's discovery. The research-work of Celarek and Saski tends further to confirm it. The former also investigated the agent described by Caronia and the immunity reactions observed by Caronia and Sidoni by means of their cultures. They agree that the virus of Caronia constitutes an invisible stage of the streptococcus of scarlet fever, and showed that, after immunisation by virus obtained from Caronia, a

positive reaction became negative; an identical effect can be obtained, however, by utilising the culture medium alone. There is therefore no question of a serological relationship between scarlet fever agents; the true explanation lies in the heterogenetic antigens, which are an essential factor in immunisation by means of the Caronia virus. This work confirmed Dick's hypothesis, and the Institute therefore decided to undertake research work on a large scale. Under the direction of CELAREK and Mme. SPARROW, more than 10,000 children were examined, 45 per cent of whom gave positive reactions. More than 10,000 children were immunised on the Dick principle with 3,500 cutaneous doses. Immunisation by the Dick process was tested in 1,000 cases and gave a favourable result in 64 per cent of the cases. Out of 7,400 children at Warsaw showing a negative Dick reaction, not a single case of scarlet fever was found. Of those showing a positive Dick reaction, 16 were taken ill. Future observations may show to what extent immunisation of this kind can check an epidemic.

Study of Malaria.

Under the direction of ANIGSTEIN, epidemiological research-work has been undertaken in regard to malaria. The technique and the guiding principles adopted are in close relation with the work of the Malaria Commission of the League of Nations, with which Dr. Anigstein has worked. Several specialists and students undertook research-work among school-children; the splenic index was determined, and in doubtful cases the blood was examined. The neighbourhood of Warsaw and fourteen districts of Poland were studied, and it was thus possible to ascertain the distribution of anopheles. Following upon the bacteriological observations thus made, special dispensaries were organised to trace cases of infection and distribute quinine.

Experimental Research on Cancer.

On the basis of the work of Blumental, who succeeded in producing tumours in rats by the use of certain bacteria

found in the tumours of human subjects, Fejgin, Epstein and Funk isolated strains of bacteria from a similar tumour. These breeds agglutinated with the Smith serum antitumefaciens. Similar strains were isolated from human tumours which produce tumours in plants.

Epidemiological and Statistical Work.

An epidemiological statistical section has for the past year been preparing statistics of infectious diseases. Kacprzak and Adamowicz investigated the registration of deaths in Poland, the epidemiology of scarlet fever at Warsaw and the statistics of typhus in the years 1920-25. It is impossible to give a summary, however brief, of the results they obtained.

2. REPORT ON THE SCIENTIFIC ACTIVITIES OF THE BIOCHEMICAL DEPARTMENT OF THE STATE SCHOOL OF HEALTH

(Dr. Casimir Funk).

The work done by this department may be classified under four principal headings, as follows:

1. *Analytical Research.*

Research-work was undertaken by Funk with Dr. Kon with a view to the improvement of methods of micro-analysis. New processes were advocated for the determination of carbon, hydrogen, nitrogen, sulphur and halogens. Improvements were also introduced in the analytical methods already described.

2. *Internal Secretions.*

The work carried out by Funk resulted in the isolation of insulin (formula C_{69} H_{101} O_{22} N_{18} S; molecular weight 1565). A clinical unit was established, equivalent to 0.026 gr. of pure insulin, and it is no longer necessary to determine it by titration on the animal. A new and cheap method of extracting insulin from the pancreas was devised. The principle of this method was applied by Funk to the extraction of hypophysein and also, with the assistance of Dr. Kon, to the treatment of parathyroids and the anterior lobe of the pituitary. An attempt was also made to obtain insulin from vegetable matter.

3. *Enzymes.*

Ferments have hitherto been purified by adsorption, but an attempt was made by Funk with Mme. Kolodziejska to purify trypsin by direct chemical methods. The results

obtained have been very promising, as it is possible, by a fairly simple manipulation, to concentrate the strength of trypsin twenty to forty times. The same method wa sapplied with Mlle. Elblinger to other ferments.

4. *Vitamines.*

Research in this field related chiefly to vitamines B and D. In conjunction with Dr. Collazo, of Montevideo, Funk studied the question of the quantities of vitamines B necessary according to the quantities of carbohydrate and protein ingested. They noted that a large quantity of carbohydrate required a considerable increase in the quantity of vitamines B. Funk also studied with Dr. Collazo the metabolism of vitamines B in the organism and its mode of elimination through the urine and stools. With Mlle. Klein, Funk endeavoured to find the alimentary value, as regards vitamines and proteins, of different layers of corn and maize. The quantities of vitamines necessary for different stocks of yeast were studied by Funk with Mlle. Zajdel. A joint study was also made of the value of the various methods of adsorption recommended for the isolation of vitamines B and D. Funk worked out, jointly with Mlle. Klein, new methods of isolating vitamines soluble in water, and studied with Mme. Szymanska the anti-beriberi action of various synthetic derivatives of pyridin.

Lastly, Funk endeavoured, in conjunction with Mlle. Fejgin's experimental work, to ascertain the characteristics of and to isolate the substance which prevents the growth of normal and neoplasic tissues.

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The foregoing account refers more especially to the activities of the Health Institute, which was founded mainly for the purpose of facilitating microbiological research. Public health, however, is not merely a question of bacteriology. Public health problems in connection with social conditions, labour and food, statistical evidence as to social conditions, sanitary engineering — all this is work which requires not only well-equipped laboratories but also abilities specially adapted for the purpose. Public health to-day is no longer a question of individuals; a whole system of social physiology and pathology has been built up, and the problems which they raise cannot be solved without the aid of the remarkable discoveries which have been made in the field of bacteriology. If laboratory research is to be of use to the general community, if the Institute is to play its proper part in the social domain, it is essential that it should train men capable of dealing both with the theoretical and with the practical problems of public health. We therefore warmly welcome the School of Public Health which has just been founded, not only because its curriculum and its laboratories will enable the field of research in which the Health Institute has hitherto been engaged to be extended, but also because it will enable us to produce an up-to-date type of public health official capable both of following theoretical research and of satisfying the demands of practical life.